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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/700,066	11/03/2003	David Alan Burton	END9-2002-0013US1	3719
45216	7590	12/16/2005	EXAMINER	
KUNZLER & ASSOCIATES 8 EAST BROADWAY SUITE 600 SALT LAKE CITY, UT 84111			GOGIA, ANKUR	
			ART UNIT	PAPER NUMBER
			2187	

DATE MAILED: 12/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/700,066	BURTON ET AL.	
	Examiner Ankur Gogia	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 03 November 2003.
- 2a) This action is FINAL.                                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 1-30 is/are pending in the application.
  - 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-30 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.
 

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____.
3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>11/3/03</u> .	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____.

**DETAILED ACTION**

1. The instant application having Application No. 10/700,066 has a total of 30 claims pending in the application; there are 6 independent claims and 24 dependent claims, all of which are ready for examination by the examiner.

***Oath/Declaration***

2. The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in 37 C.F.R. 1.63.

***Information Disclosure Statement***

3. As required by M.P.E.P. 609(c), the applicant's submission of the Information Disclosure Statement dated 3 November 2003 is acknowledged by the examiner and the cited references have been considered in the examination of the claims now pending. As required by M.P.E.P. 609(c)(2), a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.

***Specification***

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Claims 24-30 disclose a computer readable storage medium, however the specification does not mention a computer readable medium. As

a note, in correcting this issue, the applicant is reminded that the computer readable storage medium may not be directed to non-statutory subject matter (i.e. signals).

5. The disclosure is objected to because of the following informalities: On page 14, lines 5-6 of ¶54 it states "The speculative data mirroring method 600", however there is no such reference number in the drawings. It is believed that the applicant intended to state "The speculative data mirroring method 300".

Also, on page 2, lines 7-8 of ¶4 it states that transmission links are typically inefficient. This statement may be misleading to the reader as there are various types of transmission links known in the art, each with its own degree of efficiency versus the other. Also, the comparison given of a transmission link having a lower transmission rate than the read and write rates of a storage controller does not help to clear the issue, since read and writes performed by a storage controller are performed over a transmission link. Although this form of transmission link is usually more efficient than others, it is not necessarily the most efficient form of transmission link and therefore it would be misleading to state that it is more efficient than transmission links in general, as is stated in the application.

Appropriate correction to the above issues is required.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. Claim 1 recites the limitation "the lock operation" in line 8. There is insufficient antecedent basis for this limitation in the claim. It is noted that the claim provides "a synchronized operation" on line 4.

9. With respect to claims 1, 12, 21 and 22, the claims are directed towards an apparatus or system, however the elements of the claims could be implemented in hardware or software and it is unclear from the specification whether they are implemented with hardware or software. It is noted that if the embodiments are of a purely software form, they would be directed towards non-statutory matter. Therefore, the claims have been interpreted as disclosing hardware embodiments.

10. Claim 6 recites the limitation "the mirror control module is further configured to send the lock command ... to the **target storage controller**." However, in claim 4, which is a parent of claim 6, it states, "the mirror control module is further configured to send a lock command to the **target volume**." From these limitations, it is unclear whether the lock command is sent to the target storage controller or the target volume.

For this office action, it will be assumed that the lock command is sent to the target storage controller as stated in claim 6 and as discussed in the specification.

11. Claim 14 recites the limitation "the lock operation" in line 7. There is insufficient antecedent basis for this limitation in the claim. It is noted that the claim provides "a synchronous operation" on line 4.

12. Claim 19 recites the limitation "the lock operation" in line 2. There is insufficient antecedent basis for this limitation in the claim.

13. Claim 21 recites the limitation "the lock operation" in line 7. There is insufficient antecedent basis for this limitation in the claim. It is noted that the claim provides "a synchronous operation" on line 4.

14. Claim 24 recites the limitation "the lock operation" in line 8. There is insufficient antecedent basis for this limitation in the claim. It is noted that the claim provides "a synchronous operation" on line 5.

15. All other claims rejected in ¶6 and not specifically discussed above, are rejected for inheriting the deficiencies of the claims from which they depend.

***Claim Rejections - 35 USC § 103***

16. It is noted that the applicant uses the language "configured to". This can be interpreted such that the reference does not actually need to perform the task as long as **it would be capable of performing the task**. If the applicant intends for the claims to be absolute, it is recommended that the claims be amended to delete "configured to".

17. Claims 1-7, 9, 10, 14, 15, 17-25, and 27-30 are rejected under 35 U.S.C. 103(a) as being obvious over applicant's admitted prior art (AAPA) in view of Shoens et al. (U.S. Pat. 4,965,719).

**Claim 1**

AAPA discloses an apparatus for speculative data mirroring, the apparatus comprising:

a rollback log configured to receive write data, the write data corresponding to at least one write operation to a storage region within a source volume (**¶10, Lines 2-5**); and

a mirror control module configured to initiate a synchronized operation on a corresponding storage region within a target volume (**¶12, Lines 1-2**).

AAPA does not disclose expressly wherein the mirror control module is further configured to send the data corresponding to the at least one write operation to the target volume without waiting for feedback regarding the lock operation on the target volume.

Shoens et al. disclose a resource lock manager that uses an asynchronous locking strategy such that the processing of a resource lock request is overlapped with the processing incidental to accessing the resource (**Abstract; Col. 4, Lines 59-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Shoens et al., Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 1.

**Claim 2**

AAPA further discloses the apparatus further comprising a source storage controller (**Fig. 1, Item 114a**) operably connected to the source volume (**Fig. 1, Items 130a**) and a target storage controller (**Fig. 1, Item 114b**) operably connected to the target volume (**Fig. 1, Items 130b**).

**Claim 3**

AAPA further discloses the apparatus further comprising a transmission link operably connecting the source storage controller to the target storage controller (**Fig. 1, Item 150**).

**Claim 4**

AAPA further discloses wherein the synchronized operation comprises a lock operation, and the mirror control module is further configured to send a lock command to the target volume (**¶12, Lines 1-2**).

**Claim 5**

AAPA further discloses wherein the mirror control module is further configured to insert the data corresponding to the at least one write operation into the rollback log (**¶10, Lines 2-5**).

AAPA does not disclose expressly wherein the mirror control module is further configured to insert the lock command into the rollback log.

Shoens et al. disclose wherein a queue is maintained for storing pending lock requests until they are processed (**Col. 8, Line 61; Col. 9, Lines 5-6**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to store lock commands in a log until they have been processed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 5.

#### **Claim 6**

AAPA further discloses wherein the mirror control module is further configured to send the lock command (**¶11, Lines 1-2**) and the at least one write operation to the target storage controller (**¶8; ¶10, Lines 3-5**).

#### **Claim 7**

AAPA does not disclose expressly wherein the mirror control module is further configured to remove the lock command from the rollback log in response to successful execution of the lock operation on the target volume.

Shoens et al. disclose wherein a lock request is placed in a queue until it is processed (**Col. 9, Lines 61-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to incorporate logging of lock commands so that the command is placed in a log until it has been processed, at which time it is removed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 7.

### **Claim 9**

AAPA does not disclose expressly wherein the mirror control module is further configured to halt transmission of the data corresponding to the at least one write operation in response to a rejection of the lock operation.

Shoens et al. disclose halting a transaction in response to a lock request being rejected (**Col. 9, Lines 25-29**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to halt the execution of a transaction upon the rejection of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 9.

**Claim 10**

AAPA does not disclose expressly wherein the mirror control module is further configured to resume transmission of the data corresponding to the at least one write operation in response to subsequent execution of the lock operation.

Shoens et al. disclose resuming a transaction after it had been previously suspended due to rejection of a lock request (**Col. 9, Lines 30-42**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to resume a suspended transaction upon successful execution of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 10.

**Claims 14, 15 and 17-20**

Claims 14-20 disclose the method that the system of claims 1-11 is configured to perform. The combination of prior art applied to claims 1-11 discloses the system

performing this method, therefore the prior art also discloses the method and is applied to claims 14-20 as follows.

**Claim 14**

AAPA discloses a method for speculative data mirroring, the method comprising:  
Inserting data into a rollback log, the data corresponding to a write operation to a storage region within a source volume (**¶10, Lines 2-5**); and  
initiating a synchronous operation on a corresponding storage region within a target volume (**¶12, Lines 1-2**).

AAPA does not disclose expressly sending the data corresponding to the write operation to the target volume without waiting for feedback regarding the lock operation.

Shoens et al. disclose a resource lock manager that uses an asynchronous locking strategy such that the processing of a resource lock request is overlapped with the processing incidental to accessing the resource (**Abstract; Col. 4, Lines 59-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Shoens et al., Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 14.

**Claim 15**

AAPA further discloses wherein initiating a synchronous operation comprises sending a lock command to the target volume (**¶12, Lines 1-2**).

**Claim 17**

AAPA does not disclose expressly wherein inserting data into the rollback log further comprises inserting a lock command into the rollback log.

Shoens et al. disclose wherein a queue is maintained for storing pending lock requests until they are processed (**Col. 8, Line 61; Col. 9, Lines 5-6**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to store lock commands in a log until they have been processed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 17.

**Claim 18**

AAPA does not disclose expressly wherein the method further comprises removing the lock command from the rollback log in response to successful execution of the lock command on the target volume.

Shoens et al. discloses wherein a lock request is placed in a queue until it is processed (**Col. 9, Lines 61-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to incorporate logging of lock commands so that the command is placed in a log until it has been processed, at which time it is removed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 18.

### **Claim 19**

AAPA does not disclose expressly wherein the method further comprises halting transmission of the data corresponding to the at least one write operation in response to rejection of the lock operation.

Shoens et al. disclose halting a transaction in response to a lock request being rejected (**Col. 9, Lines 25-29**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to halt the

execution of a transaction upon the rejection of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 19.

#### **Claim 20**

AAPA does not disclose expressly wherein the method further comprises resuming transmission of the data stored in the rollback log in response to successful execution of the lock operation.

Shoens et al. disclose resuming a transaction after it had been previously suspended due to rejection of a lock request (**Col. 9, Lines 30-42**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to resume a suspended transaction upon successful execution of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 20.

**Claim 21**

It is noted that in the claim, the applicant uses “means”, however the applicant does not recite “means **for**”, and therefore the examiner has not interpreted the claim as invoking 112, 6<sup>th</sup> paragraph (means plus function). Based on the interpretation, claim 21 has the same scope as claim 1 and is rejected using the same arguments as applied to claim 1 above.

**Claim 22**

AAPA discloses a system for speculative data mirroring, the system comprising:  
a source storage controller (**Fig. 1, Item 114a**) operably connected to a source volume (**Fig. 1, Items 130a**);  
a target storage controller (**Fig. 1, Item 114b**) operably connected to a target volume (**Fig. 1, Items 130b**);  
a rollback log configured to receive data corresponding to a write operation to a storage region within the source volume (**¶10, Lines 2-5**);  
a storage control module operably connected to the target storage controller, the storage module configured to initiate a synchronous operation on a corresponding storage region within the target volume [**(¶12, Lines 1-2); AAPA discloses the source storage controller connected to the target storage controller and the source storage controller being able to initiate a lock operation, which is a synchronous operation, on a storage region within the target volume. Therefore, the source storage controller functions as the storage control module**].

**Claim 23**

AAPA discloses where the synchronous operation comprises a lock operation (¶12, Lines 1-2).

AAPA does not disclose expressly the system further comprising a mirror control module operably connected to the source storage controller, the mirror control module configured to send the data corresponding to the write operation to the target volume prior to receiving acknowledgement of the lock operation.

Shoens et al. disclose wherein a resource lock manager uses an asynchronous locking strategy such that the processing of a resource lock request is overlapped with the processing incidental to accessing the resource (**Abstract; Col. 4, Lines 59-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 23.

**Claims 24, 25 and 27-30**

Claims 24-30 disclose a computer readable storage medium comprising a computer readable code for performing the steps of the method of claims 14-20. Claims

24-30 perform the steps of the method of claims 14-20 and that the system of claims 1-11 is configured for. Since the prior art applied to claims 1-11 is a computer system also configured to perform these steps, it must have a computer readable storage medium comprising a computer readable code to perform the steps, since a computer system cannot operate without a computer program. Therefore, claims 24-30 are rejected using the same arguments as applied to claims 1-11 and 14-20 as discussed below.

**Claim 24**

AAPA discloses a computer readable storage medium comprising computer readable program code for conduction a method of speculative data mirroring, the method comprising:

receiving into a rollback log data corresponding to a write operation, the write operation directed to a storage region within a source volume (**¶10, Lines 2-5**); and

initiating a synchronous operation on a corresponding storage region within a target volume (**¶12, Lines 1-2**).

AAPA does not disclose expressly sending the data corresponding to the write operation to the target volume prior to receiving acknowledgement of the lock operation.

Shoens et al. disclose a resource lock manager that uses an asynchronous locking strategy such that the processing of a resource lock request is overlapped with the processing incidental to accessing the resource (**Abstract; Col. 4, Lines 59-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Shoens et al., Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 24.

### **Claim 25**

AAPA further discloses wherein initiating a synchronous operation comprises sending a lock command to the target volume (**¶12, Lines 1-2**).

### **Claim 27**

AAPA does not disclose expressly wherein inserting data into the rollback log further comprises inserting a lock command into the rollback log.

Shoens et al. disclose wherein a queue is maintained for storing pending lock requests until they are processed (**Col. 8, Line 61; Col. 9, Lines 5-6**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to store lock commands in a log until they have been processed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 27.

**Claim 28**

AAPA does not disclose expressly wherein the method further comprises removing the lock command from the rollback log in response to successful execution of the lock command on the target volume.

Shoens et al. discloses wherein a lock request is placed in a queue until it is processed (**Col. 9, Lines 61-64**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to incorporate logging of lock commands so that the command is placed in a log until it has been processed, at which time it is removed.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 28.

**Claim 29**

AAPA does not disclose expressly wherein the method further comprises halting transmission of the data corresponding to the write operation in response to rejection of the lock operation.

Shoens et al. disclose halting a transaction in response to a lock request being rejected (**Col. 9, Lines 25-29**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to halt the execution of a transaction upon the rejection of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 29.

### **Claim 30**

AAPA does not disclose expressly wherein the method further comprises resuming transmission of the data stored in the rollback log in response to successful execution of the lock operation.

Shoens et al. disclose resuming a transaction after it had been previously suspended due to rejection of a lock request (**Col. 9, Lines 30-42**).

AAPA and Shoens et al. are analogous art because they are from a similar problem solving area of improving efficiency of resource locking.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of AAPA and Shoens et al. before them, to resume

a suspended transaction upon successful execution of a lock request associated with the transaction.

The motivation for doing so would have been increasing throughput associated with the system (**Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with AAPA for the benefit of increased throughput to obtain the invention as specified in claim 30.

18. Claims 8, 16 and 26 are rejected under 35 U.S.C. 103(a) as being obvious over AAPA in view of Shoens et al. as applied to claims 1, 14 and 24 above and further in view of Yanai et al. (U.S. Pat. 5,742,792).

#### **Claims 8, 16 and 26**

The combination of AAPA and Shoens et al. do not disclose expressly wherein the mirror control module is further configured to remove the data corresponding to the at least one write operation from the rollback log in response to successfully writing the data to the target volume.

Yanai et al. disclose removing the data corresponding to a write operation from a log in response to acknowledgement from the target device that the data has been written in the target device (**Col. 3, Lines 2-11**).

The combination of AAPA and Shoens et al. and Yanai et al. are analogous art because they are from the same field of endeavor of remote data mirroring.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of the combination of AAPA and Shoens et al. and

Yanai et al. before them to incorporate removing data from a log upon acknowledgement of the data being written to a target storage device.

The motivation for doing so would have been improved performance of data transfer between data storage devices (**Col. 2, Lines 19-26**).

Therefore, it would have been obvious to combine Yanai et al. with the combination of AAPA and Shoens et al. for the benefit of improved data transfer performance to obtain the invention as specified in claims 8, 16 and 26.

19. Claim 11 is rejected under 35 U.S.C. 103(a) as being obvious over AAPA in view of Shoens et al. as applied to claim 1 above and further in view of Testardi (U.S. Pat. 6,973,549).

### **Claim 11**

The combination of AAPA and Shoens et al. does not disclose expressly wherein the mirror control module is further configured to initiate retransmission of the data corresponding to the at least one write operation in response to a rejection of the lock operation.

Testardi discloses wherein a device will retry a lock command that has been previously rejected (**Col. 43, Lines 43-47**).

The combination of AAPA and Shoens et al. and Testardi are analogous art because they are from a similar problem solving area of improving locking techniques in a system for handling data operations.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of the combination of AAPA and Shoens et al. and Testardi before them to retry a failed lock operation.

The motivation for doing so would have been efficient dispatching of data operations to a data storage device (**Col. 1, Lines 63-65**).

Therefore, it would have been obvious to combine Testardi with the combination of AAPA and Shoens et al. for the benefit of efficient dispatching of data operations to obtain the invention as specified in claim 11.

20. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being obvious over Yanai et al. (U.S. Pat. 5,742,792) in view of Shoens et al.

### **Claim 12**

Yanai et al. disclose an apparatus for bidirectional speculative data mirroring, the apparatus comprising:

- a first storage control module (**Fig. 1, Item 16**);
- a second storage control module (**Fig. 1, Item 44**);
- a first mirror control module (**Fig. 1, Item 16**);
- a second mirror control module (**Fig. 1, Item 44**).

**Note that the mirror control module is the same as the storage control module as the single element controls both storage operations to the local device and the mirroring operations to the remote device.**

Yanai et al. do not disclose expressly wherein the storage control modules are configured to conduct synchronous and lock operations or wherein the mirror control

modules are configured to initiate a lock operation on a storage region and further configured to send data corresponding to at least one write operation to the storage volume without waiting for feedback regarding the lock operation on the storage volume.

Shoens et al. disclose a resource lock manager that uses an asynchronous locking strategy such that the processing of a resource lock request is overlapped with the processing incidental to accessing the resource (**Abstract; Col. 4, Lines 59-64**).

Yanai et al. and Shoens et al. are analogous art because they are from a similar problem solving area of improving throughput associated with data processing in storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Shoens et al., Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with Yanai et al. for the benefit of increased throughput to obtain the invention as specified in claim 12.

### **Claim 13**

Yanai et al. discloses the system further comprising a first rollback log configured to receive data corresponding to the at least one write operation to the first storage volume and a second rollback log configured to receive data corresponding to the at least one write operation to the second storage volume (**Col. 2, Line 66 – Col. 3, Line 2**).

Yanai et al. do not disclose expressly wherein the synchronous storage operations comprise a lock operation.

Shoens et al. disclose a resource lock manager that uses an asynchronous locking strategy to manage access to shared data (**Abstract; Col. 4, Lines 59-64**).

Yanai et al. and Shoens et al. are analogous art because they are from a similar problem solving area of improving throughput associated with data processing in storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Yanai et al. and Shoens et al. before them, to incorporate asynchronous locking into a remote mirroring system.

The motivation for doing so would have been increasing throughput associated with the system (**Shoens et al., Abstract**).

Therefore, it would have been obvious to combine Shoens et al. with Yanai et al. for the benefit of increased throughput to obtain the invention as specified in claim 13.

#### ***Relevant Art Cited by the Examiner***

21. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure. See M.P.E.P. 707.05(c).

The following reference teaches an asynchronous locking method wherein I/O processing is overlapped with the wait time for a lock operation:

“Look Processing in a Shared Data Base Environment”

***Conclusion***

22. The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. 707.07(i):

Per the instant office action, claims 1-30 have received a first action on the merits and are subject of a first action non-final.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ankur Gogia whose telephone number is 571-272-4166. The examiner can normally be reached on M-F 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 571-272-4201. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Ankur Gogia  
Examiner  
Art Unit 2187

12/9/05

  
CHRISTIAN CHACE  
PRIMARY EXAMINER